REMARKS

Claims 3-5 are pending in this application. By this Amendment, claims 3-5 are amended. These amendments are supported by Applicant's specification at least at, page 5, line 18 - page 7, line 5 and Tables 2 and 3. No new matter is added. Reconsideration of the application based on the above amendments and the following remarks is respectfully requested.

The courtesies extended to Applicant's representatives by Examiner Kuo at the personal interview held February 9, 2009 and by Examiner Dickey in the telephone interview held February in the 11, 2009 are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below, which constitute Applicant's record of the interview.

The Office Action rejects claim 4 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 7,009,200 to Tezuka et al. (hereinafter "Tezuka") in view of U.S. Patent Application Publication No. 2003/0011009 to Zhang et al. (hereinafter "Zhang"). This rejection is respectfully traversed.

During the February 11 telephone interview, Examiner Dickey indicated that the Examiners believed that claims 3-5 may be rejected under 35 U.S.C. 103(a) as being unpatentable over Tezuka, and that combination with any of the other references applied in the October 22, 2008 Office Action may be unnecessary. In particular, the Examiners assert that Tezuka at, col. 8, lines 24-27 teaches, the source region being a different material from the drain region, and that this portion of Tezuka combined with embodiments disclose by Tezuka at col. 4 would have suggested all of the combinations of features recited in the pending claims. Applicant disagrees.

The Office Action concedes that Tezuka does not teach that the source material and drain material are different materials. The Office Action asserts that Zhang remedies these

shortfalls of Tezuka. The analysis of the Office Action fails for the following reason.

Claim 4 recites, among other features, the source, the drain and the channel materials being selected, such that an upper level of a valence band of the drain material is higher than an upper level of a valence band of the channel material and an upper level of a valence band of the source material is lower than the upper level of the valence band of the channel material. The Office Action asserts that Tezuka teaches these features at Fig. 1C. As noted above, the Office Action concedes that Tezuka does not teach that the source and drain materials are different materials. The upper level of a valence band of the material is a material property. Thus, because the source and drain materials of Tezuka are the same, the upper level of a valence band of the source and drain materials of Tezuka is identical.

Fig. 1C is included in Tezuka to demonstrate how the strained channel material alters the electric field within the drain to accelerate electrons more rapidly in the channel regions (see continuous line in the channel compared with dashed line in Fig. 1C of Tezuka). In Fig. 1C the transistor is depicted while in operation, thus a bias voltage is present between the source and drain. The upper level of the valence band is thus shifted by the bias voltage between the source and drain. Therefore, as agreed during February 11 the personal interview, Fig. 1C Tezuka would not have suggested at an upper level of a valence band of the drain material is higher than an upper level of a valence band of the channel material and an upper level of a valence band of the source material is lower than the upper level of the valence band of the channel material because the upper level of a valence band of the source materials of Tezuka are identical.

Additionally, claim 4 recites, among other features, the source material is different from the drain material the source and drain materials having at least one unshared element. The Office Action asserts that this feature is disclosed by Zhang. Zhang teaches, at paragraph [0029], "[i]n this embodiment, the first metal silicide material 114 comprises ErSi and the

second metal silicide material 116 comprises PtSi. Thus, the drain of the N-channel device 110 and the source of the P-channel device 108 are formed of ErSi, while the source of the N-channel device 110 and the drain of the P-channel device 108 are formed of PtSi." Further, Zhang further teaches at, *e.g.*, paragraph [0002], "[m]etal silicides are used to form natural Schottky barriers to silicon substrates that confine the carriers, reducing or eliminating the need for dopant impurities in the channel." Thus, Zhang teaches the channel made from undoped silicon. Zhang teaches, at, *e.g.*, paragraph [0031], the specific requirements regarding work function, valence band, conduction band or the source drain and channel materials. Tezuka teaches, at, *e.g.*, col. 2, lines 48-29, "[t]he first embodiment is a pMOSFET which has a strained-$Si_{1-x}Ge_x$ layer 20 as a channel formed on a SiO_2 film 12 as shown in FIG. 1A." Thus, the channel material of Tezuka is different from that of Zhang, and therefore the conduction and valence band energies of the channel of Tezuka are different from those of the channel of Zhang.

In view of the above, Applicant respectfully asserts that it would not have been predictable to combine the source and drain materials of Zhang with the channel of Tezuka, as asserted by the Office Action, with any reasonable expectation of success in addressing the features recited in claim 4.

As discussed during the personal and telephone interview, the Examiners asserted that Tezuka would have suggested that the source and drain material are different by combining col. 4, lines 59-60 of Tezuka with col. 8, lines 24-27 of Tezuka.

Tezuka at, col. 8, lines 24-27 teaches, lattice strain increases toward the drain end by providing a $Si_{1-u-v}Ge_uC_v$ polycrystalline layer as a part of the source region adjacent to the channel layer. This portion of Tezuka is referring to preferred aspects of embodiments disclosed at col. 7, line 59 - col. 8, line 53. This portion of Tezuka discloses that a field effect transistor includes a source, a drain, and a channel layer of $Si_{1x-yv}Ge_xC_y$ crystal. Thus, this

portion of Tezuka teaches the source drain and channel materials are identical. Col. 8, lines 24-27 merely teaches that the polycrystalline layer of $Si_{1-u-v}Ge_uC_v$ as a part of the source region, Tezuka does not teach that this polycrystalline layer is the source material. Thus, this polycrystalline layer may be a polycrystalline layer on top of or below the source material placed to strain the source material. No other portion of Tezuka would have suggested that the source and drain material are different. Further, the source, drain and channel of the embodiment disclosed in col. 7 are Silicon Germanium Carbon crystal, the layer disclosed at col. 8, lines 24-27 is polycrystalline. Throughout Tezuka, the source, drain and channel materials are crystalline, not polycrystalline.

For the above reasons, Applicant respectfully asserts that one of ordinary skill would not have concluded that the polycrystalline layer disclosed in col. 8, line 24-27 is the source material. Further, during the interviews, the Examiners appear to draw conclusions through the impermissible use of hindsight reasoning based on the roadmap provided by the Applicant's application. Applicant asserts that it would not have been predictable to combine this polycrystalline layer with any other embodiment of Tezuka to render obvious the combination of all of the features recited in claim 4 without the disclosure provided by Applicant's application.

As noted above, claim 4 recites that the source and drain material have at least one unshared element. Thus, even if the alleged polycrystalline layer disclosed by Tezuka at col. 8, lines 24-27 were material that forms the source of a transistor, Tezuka cannot reasonably be considered to teach that the source and drain materials have at least one unshared element. The embodiments disclosed at col. 7, lines 59- col. 8, line 27 have source and drain regions including the elements Silicon Germanium and Carbon. Thus, at least this feature cannot reasonably be considered to have been suggested by Tezuka.

For at least the foregoing reasons, no combination of the embodiments of Tezuka or combination of Tezuka with Zhang can reasonably be considered to have suggested the combination of all of the features recited in claim 4.

Accordingly, reconsideration and withdrawal of the rejection of claim 4 under 35 U.S.C. 103(a) as being unpatentable over Tezuka in view of Zhang are respectfully requested.

The Office Action rejects claims 3 and 5 under 35 U.S.C. §103(a) as being unpatentable over Tezuka in view of U.S. Patent No. 4,885,614 to Furukawa et al. (hereinafter "Furukawa") further in view of U.S. Patent No. 2,918,396 to Hall. This rejection is respectfully traversed.

The Office Action concedes that Tezuka does not teach the source material and the drain material are different materials. The analysis of the Office Action fails for the following reasons.

The Office Action fails to indicate which of Furukawa and Hall would have suggested the source material and the drain material are different materials, or how it would have otherwise been suggested by the prior art.

As argued above for claim 4, and as discussed in during the interviews, Tezuka cannot reasonably be considered to have suggested that the source and drain materials are different materials. Further, as argued above for claim 4, and as discussed during the personal interviews, Tezuka would not have suggested that the source material is different from the drain material, the source and drain materials having at least one unshared element, as recited in claim 3. Further, as argued above for claim 4, Tezuka would not have suggested that the NMOS source material is different from NMOS drain material, the NMOS source and the NMOS drain material having at least one unshared element, and the PMOS source material is different from the PMOS drain material, the PMOS source and the PMOS drain material having at least one unshared element, as recited in claim 5.

As argued above, regarding claim 4, Tezuka teaches throughout the disclosure that the source and drain materials contain the same elements, and thus Applicant respectfully asserts that Tezuka would not have suggested an embodiment in which the source and drain materials contain at least one unshared element. Thus, Tezuka would not have suggested the above features in claims 3 and 5.

Regarding the combination of Tezuka with Furukawa and Hall, the Office Action asserts that it would have been obvious to provide the transistor source of Tezuka with the diamond structure of carbon of Furukawa, and further modify the diamond structure of carbon of Furukawa with the silicon-carbon alloy of Hall.

Further, the Office Action concedes that Tezuka does not explicitly teach the benefits of using silicon-carbon alloy without germanium. The Office Action asserts that Furukawa with Hall remedies this shortfall of Tezuka. This analysis fails for the following reason.

Furukawa teaches incorporating carbon into a silicon-germanium alloy (see, *e.g.*, col. 2, lines 3-10), a feature already disclosed by Tezuka. Thus, Applicant respectfully asserts that Furukawa would not have suggested the removal of germanium from a silicon-germanium-carbon alloy.

Hall discloses silicon-carbide (see *e.g.*, col. 1, lines 15-18). Thus, Applicant respectfully asserts that Hall would not have suggested removing germanium from a silicon-germanium-carbon alloy. Hall would not have suggested any alloy with germanium. Further, Hall teaches, a rectifier (see *e.g.*, col. 6, line 16) and NPN and PNP junction transistors (see *e.g.*, col. 6, line 63 - col. 7, line 27) with a base, collector and emitter. Hall would not have suggested a source or drain material.

Furukawa teaches, at, *e.g.*, col. 3, lines 16-19, that lattice constant of a crystal (with a diamond structure) of carbon which is a group for element like silicon and germanium is smaller than that of silicon crystal. This portion of Furukawa merely indicates that the crystal

of carbon is diamond as opposed to graphite, and would have not suggested carbon within an alloy of silicon, germanium or silicon-germanium. Further, Furukawa would not have suggested pure carbon in the form of a diamond as a source or drain material, or even as a semi-conductor material.

Accordingly, Applicant respectfully asserts that the combination of Tezuka with Furukawa and Hall would not have suggested a silicon-carbide source or drain material. Therefore, this combination of references would not have suggested an electron affinity of the source material is higher than the electron affinity of the channel material, as recited in claims 3 and 5.

For at least the foregoing reasons, the combination of Tezuka with Furukawa and Hall cannot reasonably be considered to have suggested the combinations of all of the features recited in claims 3 and 5. Accordingly, reconsideration and withdrawal of the rejection of claims 3 and 5 under 35 U.S.C. 103(a) as being unpatentable over Tezuka in view of Furukawa further in view of Hall are respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 3-5 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

William P. Berridge
Registration No. 30,024

John S. Kern
Registration No. 42,719

WPB:MIL/add

Date: March 6, 2009

OLIFF & BERRIDGE, PLC
P.O. Box 320850
Alexandria, Virginia 22320-4850
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461